# **Original Research**

# Alteration of Lipid Profile in Patients with Head and Neck Malignancy

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#### Abstract

Aim: The aim of this study is to investigate the alterations in lipid profile parameters (total cholesterol, triglycerides, HDL, LDL, and VLDL) in patients with head and neck malignancies and to compare these findings with a control group, in order to explore potential associations between lipid metabolism and cancer presence. Materials and methods: This prospective observational study was conducted on 50 newly diagnosed, histopathologically confirmed patients with head and neck malignancy. For comparison, 25 healthy age- and sex-matched individuals without any renal or cardiac dysfunction were enrolled as controls. All subjects were further categorized based on their tobacco consumption habits into two subgroups: those with and those without a history of tobacco use. Inclusion criteria for the study group required clinical and histopathological confirmation of head and neck cancer, while exclusion criteria ruled out individuals with obesity, hypertension, diabetes mellitus, coronary artery disease, myocardial infarction, and any cardiac, renal, or hepatic dysfunction. Subjects undergoing chemotherapy or radiotherapy or taking lipid-altering drugs were also excluded. Fasting blood samples were collected from all participants and analyzed for lipid profile parameters following standard procedures as recommended in the literature. Data analysis was done using SSPS software. Results: Among the head and neck cancer cases, 56% were female and 44% were male. In the control group, 52% were female and 48% were male. Among the head and neck cancer cases, 24% were located in the buccal mucosa, 10% on the tongue, 12% on the lips, and 10% in other parts of the oral cavity. Oropharyngeal cancers accounted for 6%, while no cases were reported in the nasopharynx. In the laryngeal region, 16% were supraglottic, 12% glottic, and 2% subglottic. Additionally, 8% of cases were found in the maxilla. Significant alteration of lipid profile was seen among carcinoma patients. Conclusion: The study indicates significant alterations in total cholesterol and HDL levels in head and neck cancer patients compared to controls, suggesting a potential link between lipid profile changes and cancer presence. However, further research with larger samples is needed to confirm these findings and account for confounding factors like tobacco use.

Keywords: tobacco, lipid, cholesterol, Transplantation

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## Introduction

In recent years, growing attention has been directed toward the detection of molecular markers in body fluids such as saliva and urine for diagnosing, predicting prognosis, and monitoring the progression of oral cancer. Blood-based tests for malignancies are particularly appealing due to their non-invasive nature, cost-effectiveness, ease of use, and ability to allow for repeated sampling. Among the various molecular components studied, lipoproteins complexes of proteins and lipids—play a crucial role in transporting lipids through the bloodstream.<sup>1,2</sup>

Lipids, which include fats, oils, waxes, phospholipids, and steroids, are high-energy molecules vital for numerous cellular functions. Triglycerides (TGs), formed by one glycerol and three fatty acids, are the primary form of energy storage in the body. For their transport in plasma, TGs and cholesterol are encapsulated within lipoproteins, which are subsequently taken up by cells for functional use.<sup>3</sup> Lipids are fundamental to cell membrane structure and integrity, playing key roles in cellular growth, division, membrane enzyme activity, and DNA stabilization. Lipoproteins are broadly categorized into high-density lipoprotein (HDL), which helps remove cholesterol from the bloodstream, and lowdensity lipoprotein (LDL), which carries about 75% of plasma cholesterol. While most circulating LDL is cleared by cell receptors, the remaining portion contributes to cholesterol buildup in arterial walls.<sup>4</sup>

Head and neck squamous cell carcinoma (HNSCC) comprises a group of cancers that originate from the squamous cells lining the head and neck region, including the oral cavity, pharyngeal areas (hypopharynx, nasopharynx, oropharynx), lip, nasal cavity, paranasal sinuses, and salivary glands. These anatomical sites play essential roles in breathing, swallowing, and conditioning inhaled air. HNSCC represents a major global health issue, with its incidence and mortality rates varying considerably across geographic regions and population groups. Men, older individuals, and those from lower socioeconomic backgrounds are disproportionately affected. Recognizing these epidemiological trends is crucial for developing and implementing targeted strategies to reduce the burden of HNSCC and enhance prevention efforts.5,6,7

The aim of this study is to investigate the alterations in lipid profile parameters (total cholesterol, triglycerides, HDL, LDL, and VLDL) in patients with head and neck malignancies and to compare these findings with a control group, in order to explore potential associations between lipid metabolism and cancer presence.

## Materials and methods

This prospective observational study was conducted on 50 newly diagnosed, histopathologically confirmed patients with head and neck malignancy. For comparison, 25 healthy age- and sex-matched individuals without any renal or cardiac dysfunction were enrolled as controls. All subjects were further categorized based on their tobacco consumption habits into two subgroups: those with and those without a history of tobacco use.

Inclusion criteria for the study group required clinical and histopathological confirmation of head and neck cancer, while exclusion criteria ruled out individuals with obesity, hypertension, diabetes mellitus, coronary artery disease, myocardial infarction, and any cardiac, renal, or hepatic dysfunction. Subjects undergoing chemotherapy or radiotherapy or taking lipid-altering drugs were also excluded. Fasting blood samples were collected from all participants and analyzed for lipid profile parameters following standard procedures as recommended in the literature. Data analysis was done using SSPS software.

## Results

Table 1: Gender Distribution							
S. no.	Sex	Sex No. of cases of head Percentage (%) No. of controls					
		and neck cancers			(%)		
1	Female	28	56	13	52		
2	Male	22	44	12	48		
		50	100	25	100		

Among the head and neck cancer cases, 56% were female and 44% were male. In the control group, 52% were female and 48% were male.

S. no.	Site	Subsites	No. of cases	Percentage (%)			
1	Oral cavity	Buccal mucosa	12	24			
		Tongue	5	10			
		Lips	6	12			
		Others	5	10			
2	Pharynx	Nasopharynx	0	0			
		oropharynx	3	6			
3	Larynx	Supraglottis	8	16			
		Glottis	6	12			
		Subglottis	1	2			
4	Maxilla	-	4	8			
	Total		50	100			

#### Table 2: Site wise distribution

Among the head and neck cancer cases, 24% were located in the buccal mucosa, 10% on the tongue, 12% on the lips, and 10% in other parts of the oral cavity. Oropharyngeal cancers accounted for 6%, while no cases were reported in the nasopharynx. In the laryngeal region, 16% were supraglottic, 12% glottic, and 2% subglottic. Additionally, 8% of cases were found in the maxilla.

Table 5. Lipiu prome in neau and neck cancel versus controls							
S. no.	Parameter	Control $(n = 25)$	rol (n = 25) Head and neck cancers cases (n = 50)				
	assessed	mean ± SD (mg/dl)	mean $\pm$ SD (mg/dl)	value			
1	TC	123.12±5.12	$114.63 \pm 5.72$	< 0.002			
2	TG	102.84±4.78	$89.64 \pm 6.77$	0.54			
3	HDL	64.12±7.14	$56.72 \pm 6.12$	< 0.003			

# Table 3: Lipid profile in head and neck cancer versus controls

4	LDL	111.32± 4.85	$100.2 \pm 3.43$	0.53
5	VLDL	$31.55 \pm 5.67$	$30.93 \pm 5.86$	0.32
		D 0.05		

P < 0.05 = statistically significant

	ТС	TG	HDL	LDL	VLDL
Control without habit of tobacco	$198.3 \pm 14.2$	$110.31 \pm 10.32$	$37.62 \pm 3.32$	$110.23 \pm$	$18.45 \pm$
				6.22	4.65
Control with habit of tobacco	$176.4 \pm 5.12$	$112.42\pm4.56$	$30.42 \pm 5.12$	$107.2 \pm$	$17.42 \pm$
				4.22	3.51
Control with habit of tobacco	$152.11 \pm 2.56$	$100.2 \pm 2.42$	$19.32\pm4.51$	$111.42 \pm$	12.34±
				32.2	5.23
А	P' = 0.02	'P' = NS'	'p=0.002'	'P' = NS'	P' = NS'
В	P' = NS'	'P' = NS'	'p=0.012'	'P' = NS'	'P' = NS'

Table 4: Compa	rison of lipid	profile with habit	t of tobacco	consumption
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NS not significant

A control without habit of tobacco versus cancer B control with habit of tobacco versus cancer

## Discussion

Head and neck malignancies represent a diverse group of cancers that arise in the oral cavity, pharynx, larynx, nasal cavity, and associated structures. These cancers are a significant global health concern due to their rising incidence, morbidity, and mortality. Recent studies have indicated a possible link between systemic metabolic changes and cancer development, particularly concerning lipid metabolism.<sup>8</sup> Lipids play essential roles in cell membrane integrity, energy storage, and signal transduction, and alterations in their levels may reflect or influence the pathophysiology of malignant transformations. In patients with head and neck cancer, changes in lipid profile parameters-including total cholesterol, triglycerides, low-density lipoprotein (LDL), highdensity lipoprotein (HDL), and very-low-density lipoprotein (VLDL)-have been observed, suggesting that these biomarkers might have diagnostic, prognostic, or therapeutic relevance.9,10 Understanding these alterations could provide new insights into tumor biology and support the development of adjunctive diagnostic strategies.

In our study among the head and neck cancer cases, 56% were female and 44% were male. In the control group, 52% were female and 48% were male. Among the head and neck cancer cases, 24% were located in the buccal mucosa, 10% on the tongue, 12% on the lips, and 10% in other parts of the oral cavity. Oropharyngeal cancers accounted for 6%, while no cases were reported in the nasopharynx. In the laryngeal region, 16% were supraglottic, 12% glottic, and 2% subglottic. Additionally, 8% of cases were found in the maxilla. In terms of histopathological grading, 26% of the cases were well differentiated, 28% were moderately differentiated, 12% were poorly differentiated, and 8% were undifferentiated. Additionally, 6% of the cases fell under other categories.

Lohe VK et al.<sup>11</sup> conducted a study to evaluate and correlate decreased cholesterol levels in oral cancer,

oral precancer, and tobacco use. The study included 210 subjects, comprising 70 histopathologically confirmed cases each of oral cancer and oral precancer, along with 70 age- and sex-matched healthy controls with no history of major illness. The results showed a significant decrease in TC, HDL, VLDL, and triglycerides in the oral cancer group, and a significant decrease in TC and HDL in the oral precancer group compared to controls. However, no significant differences in lipid profiles were observed between NHT and WHT subjects. The study concluded an inverse relationship between serum lipid profile and the presence of oral cancer and precancer, with no significant overall correlation with tobacco use.

In the study by Poorey VK et al.<sup>12</sup> the objective of this case–control study was to evaluate the alterations and clinical significance of plasma lipid profiles in patients with untreated head and neck malignancies. The findings revealed a higher incidence of head and neck malignancies among males, predominantly in the 41–60-year age group, with oral cavity cancers being the most common and largely well-differentiated. A statistically significant reduction in mean serum total cholesterol (TC), triglycerides, and high-density lipoprotein (HDL) levels was observed in malignancy cases compared to controls. Additionally, TC and HDL levels were notably lower among individuals with a history of tobacco use.

In a study conducted by Chawda JG et al.<sup>13</sup>, the objective was to examine alterations in plasma lipid profiles and their clinical relevance in untreated head and neck cancer patients. The study included 30 subjects, comprising 25 oral cancer patients and 5 healthy controls. Fasting blood samples were analyzed for lipid parameters-cholesterol, triglycerides, HDL, LDL, and VLDL-using spectrophotometric kits with the CHOD-PAP method. Statistical analysis was performed using ANOVA and post hoc tests. The results revealed significantly lower levels of total lipids, cholesterol, and HDL in oral cancer patients compared to controls, while LDL and VLDL levels showed no significant differences. The study concluded that a decrease in plasma lipid levels was inversely associated with the presence of oral cancer,

suggesting that reduced lipid profiles could serve as early indicators of neoplastic changes.

One notable drawback in studying lipid profile alterations in head and neck malignancy is the influence of confounding factors such as diet, lifestyle, smoking, alcohol consumption, and concurrent systemic diseases, all of which can independently affect lipid levels. These variables make it challenging to establish a direct causal relationship between lipid profile changes and cancer development, potentially limiting the reliability and generalizability of findings.

Another significant drawback is the limited sample size in many studies, which reduces the statistical power and may not accurately represent the broader population. Small sample sizes increase the risk of bias, limit subgroup analysis, and may lead to inconclusive or non-generalizable results, thereby affecting the strength of the association between lipid profile alterations and head and neck malignancies.

#### Conclusion

The study indicates significant alterations in total cholesterol and HDL levels in head and neck cancer patients compared to controls, suggesting a potential link between lipid profile changes and cancer presence. However, further research with larger samples is needed to confirm these findings and account for confounding factors like tobacco use.

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